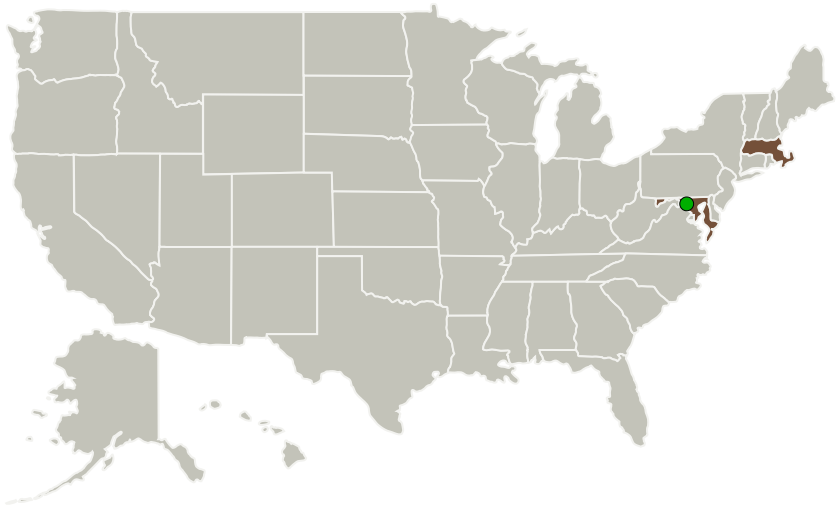
High Performing PFPE Nanofluid Lubricants, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Space missions could benefit from improved lubricant technology. PSI intends to develop novel liquid lubricant formulations which are applicable for future NASA missions. Our concept is based upon use of nanofluid technology whereby stable, colloidal suspensions of additives are present in perfluoropolyalkylether (PFPE) base fluids. The additives will become sheared within minute scratches and grooves while separating surface asperities. At the conclusion of Phase I, we will have prepared ~ 10 nm diameter additives with ~ 115 m2/g and ~ 80 m2/g gravimetric surface areas, respectively. Their surface will have been chemically modified and shown stable from -65oC to +65oC. A 50% reduction in friction and wear at steel surfaces upon dispersion of the additive to PFPE will have been demonstrated. PSI will have shown that the viscosity of Uniflor 8960 PFPE is maintained at 60 cSt ± 5% upon formulation with the additive. PSI will have demonstrated that the particles maintain an average particle size of ~ 10 nm within PFPE, and would have settling times > 5 years. The TRL at the beginning of the Phase I contract will be at 2, while the TRL at the completion of the Phase I contract will be at 3-4.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Physical Sciences, Inc.	Lead Organization	Industry	Andover, Massachusetts
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138216)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Physical Sciences, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

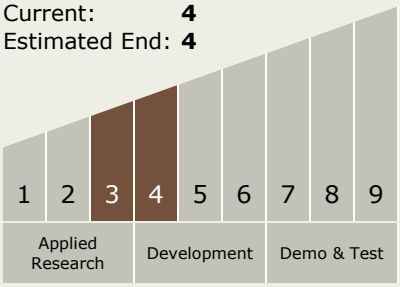
Carlos Torrez

Principal Investigator:

Bryan Bergeron

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System